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Nonlinear spin conductance of yttrium iron garnet thin films driven by large spin-orbit torque

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Abstract

© 2018 American Physical Society. We report high power spin transfer studies in open magnetic geometries by measuring the spin conductance between two nearby Pt wires deposited on top of an epitaxial yttrium iron garnet thin film. Spin transport is provided by propagating spin waves that are generated and detected by direct and inverse spin Hall effects. We observe a crossover in spin conductance from a linear transport dominated by exchange magnons (low current regime) to a nonlinear transport dominated by magnetostatic magnons (high current regime). The latter are low-damping magnetic excitations, located near the spectral bottom of the magnon manifold, with a sensitivity to the applied magnetic field. This picture is supported by microfocus Brillouin light-scattering spectroscopy. Our findings could be used for the development of controllable spin conductors by variation of relatively weak magnetic fields.

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